# Assignment-5

**Problem Statement:-**
Develop functions to insert and delete into/from a max heap.

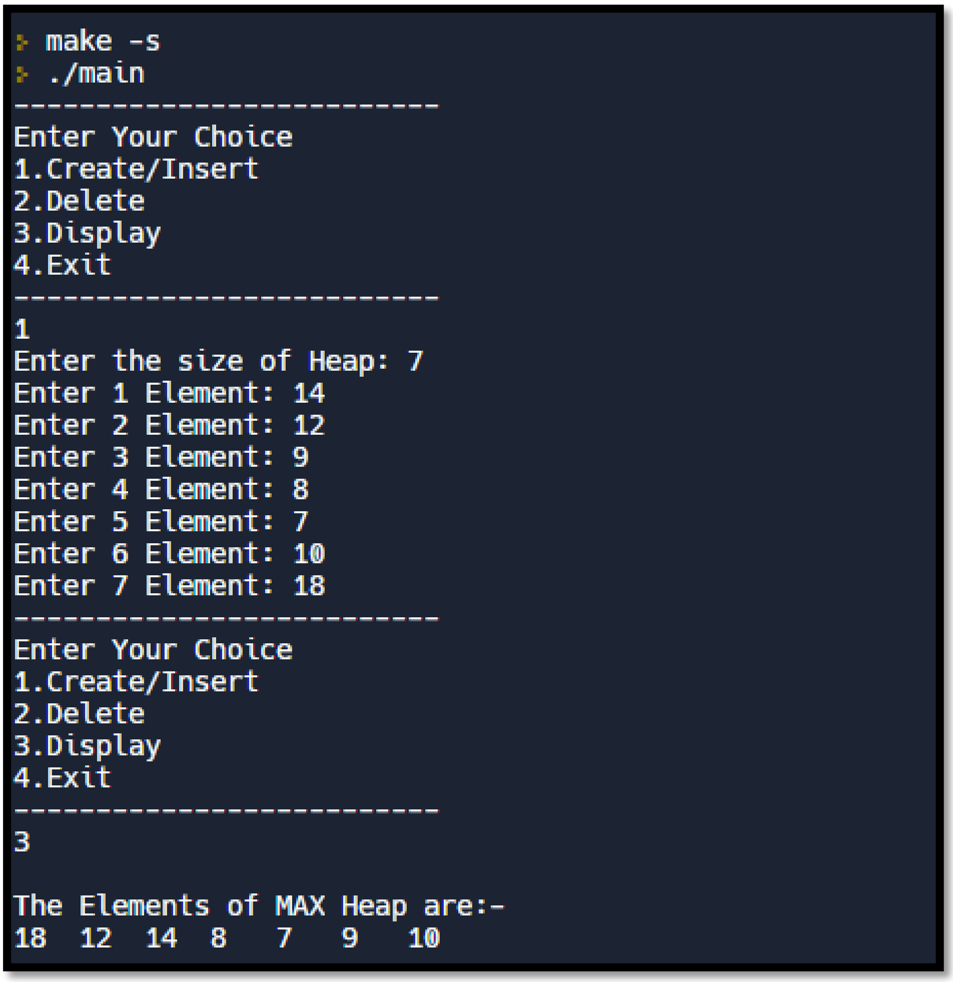
**Course Objective:-** To know the basics of computational complexity analysis and various algorithm design strategies.

**Course Outcomes:-** Students will be able to Build the various algorithmic design paradigms.

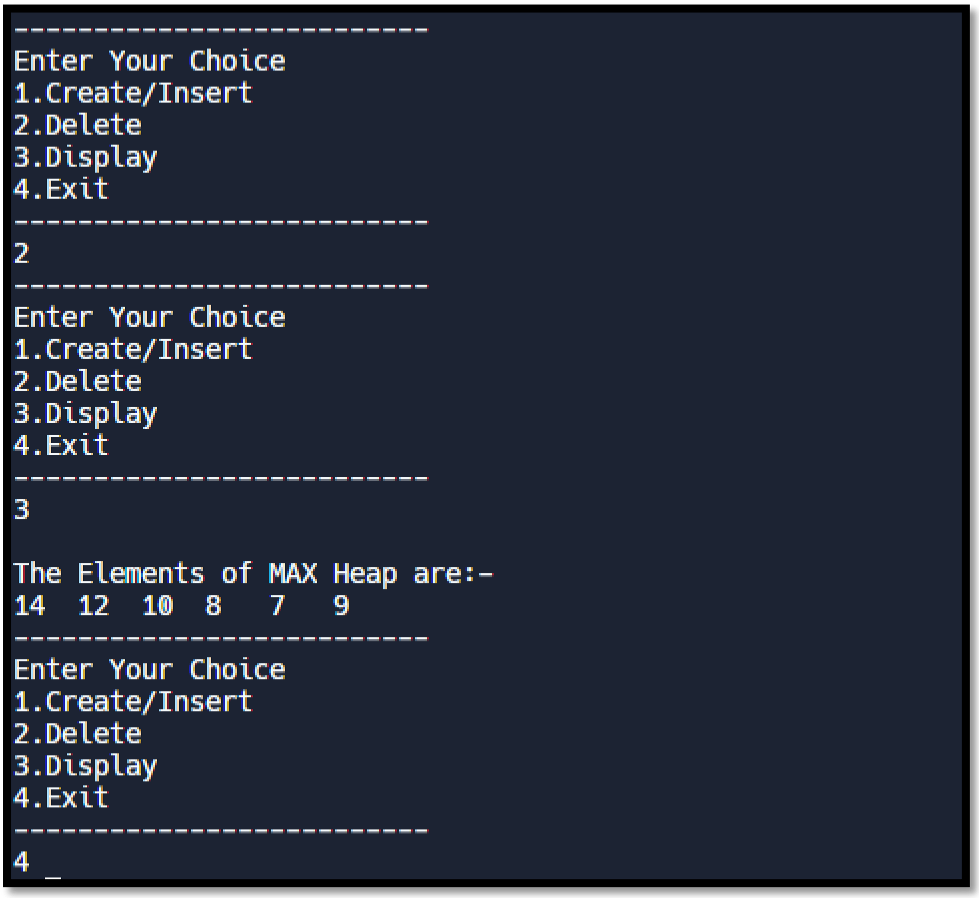
**Program:-**

```
#include<stdio.h>

#define MAX 100

int h[MAX];


void swap(int *a,int *b){

  int c=*a;

  *a=*b;

  *b=c;

}


void heap_up(int h[],int i){

  int parent=(i-1)/2;

  if(h[i]>h[parent] && i>0){

    swap(&h[i],&h[parent]);

    heap_up(h,parent);

  }

}


void display(int h[],int size){

  printf("\nThe Elements of MAX Heap are:-\n");
  for(int i=0;i<size;i++){
    printf("%d\t",h[i]);
  }
  printf("\n");
}

void create(int h[],int size){
  int n;
  for(int i=0;i<size;i++){
    printf("Enter %d Element: ",i+1);
    scanf("%d",&n);
    h[i]=n;
    heap_up(h,i);
  }
}

void heap_down(int h[],int i,int last){

  int l,r;
  l=2*i+1;
  r=2*i+2;
  int largest=i;
  if(l<=last && h[i]<h[l]){
    largest=l;
  }
  if(r<=last && h[r]>h[l]){
    largest=r;
  }
  if(largest!=i){
    swap(&h[i],&h[largest]);
    heap_down(h,largest,last);
  }
}

int delete(int h[],int size){

  swap(&h[0],&h[size-1]);
  size--;
  heap_down(h,0,size-1);
  return size;
}

int main(){
  int size,c;
  do{
    printf("--------------------------\nEnter Your Choice
\n1.Create/Insert\n2.Delete\n3.Display\n4.Exit\n--------------------------\n");
    scanf("%d",&c);
    switch(c){
      case 1:
        printf("Enter the size of Heap: ");
        scanf("%d",&size);
        create(h,size);
      break;

      case 2:
        size=delete(h,size);
      break;
      case 3:
        display(h,size);
      break;
    }
  }while(c!=4);
  return 0;
}
```

**Output:-**



```
> make -s
> ./main
--------------------------
Enter Your Choice
1.Create/Insert
2.Delete
3.Display
4.Exit
--------------------------
1
Enter the size of Heap: 7
Enter 1 Element: 14
Enter 2 Element: 12
Enter 3 Element: 9
Enter 4 Element: 8
Enter 5 Element: 7
Enter 6 Element: 10
Enter 7 Element: 18
--------------------------
Enter Your Choice
1.Create/Insert
2.Delete
3.Display
4.Exit
--------------------------
3

The Elements of MAX Heap are:-
18  12  14  8   7   9   10
```



```
--------------------------
Enter Your Choice
1.Create/Insert
2.Delete
3.Display
4.Exit
--------------------------
2
--------------------------
Enter Your Choice
1.Create/Insert
2.Delete
3.Display
4.Exit
--------------------------
3

The Elements of MAX Heap are:-
14  12  10  8   7   9
--------------------------
Enter Your Choice
1.Create/Insert
2.Delete
3.Display
4.Exit
--------------------------
4 _
```